A8-R4 : BASICS OF OS, UNIX AND SHELL PROGRAMMING

Objective of the Course

The objective of the course is to make students aware of the functioning of a multi-user operating system. This course will serve as a foundation course for the higher level course in Unix. The students are expected to learn the commands while doing practical and emphasis should be given to those switches/options and flags, which are most frequently used in real life.

After completion of the course students will be able to:

- Understand Operating System concepts.
- Use System calls and memory management.
- Use Unix commands and editors.
- Carry out Unix File management and shell programming in Unix.
- Do Network configuration and security management in Unix.

Outline of Course

S. No.	Topic	Minimum number of hours
1.	Operating System Concepts	04
2.	Linux Ideas and History	01
3.	Linux Usage Basics	02
4.	Running commands and Getting help	02
5.	Browsing the file system	04
6.	The X-Window System	04
7.	Users, Groups and Permissions	03
8.	Advanced Topics in Users, Groups and Permissions	03
9.	The Linux file system in-depth	06
10.	vim: An advanced text editor	03
11.	Standard I/O and Pipes	02
12.	Using the bash shell	03
13.	Configuring the Bash Shell	04
14.	Text Processing Tools	03
15.	Shell Programming	06
16.	Investigating and managing process	04
17.	Finding and Processing Files	02
18.	Basic System Configuration Tools	04

Lectures	**=**	**60**
Practical/tutorials	**=**	**60**
Total	**=**	**120**

Detailed Syllabus

1. Operating System Concepts   04 Hrs.
Overview of OS. System Calls, Process Management, Memory Management, Disk and filesystems, Networking, Security, Graphical User Interface, Device Drivers.

2. Linux Ideas and History   01 Hrs.
What is Open Source? , Linux Origins, Red Hat Distributions, Linux Principles

3. Linux Usage and Basics   02 Hrs.
Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Elements of the X Window System, Starting the X server, Changing your password, The root user, Changing identities, Editing text files.

4. Running Commands and Getting Help   02 Hrs.
Running Commands, Some Simple commands, Getting Help, The whatis command, The –help Option, Reading Usage Summaries, The man command, Navigating man pages, The info command, Navigating info pages, Extended Documentation, Red Hat Documentation.

5. Browsing the Filesystem   04 Hrs.
Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents, Copying Files and Directories, Copying Files and Directories: The Destination, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories, Using Nautilus, Determining File Content.

6. The X-Window System   04 Hrs.
XOrg: The X11 Server, XOrg Server Design, XOrg Server Configuration, XOrg Modularity, Server and Client Relationship, XOrg in runlevel 3, XOrg in runlevel 5, Configuration Utilities, Remote X Sessions.

7. Users, Groups and Permissions   03 Hrs.
Users, Groups, Linux File Security, Permission Precedence, Permission Types, Examining Permissions, Interpreting Permissions, Changing File Ownership, Changing Permissions – Symbolic Method, Changing Permissions – Numeric Method, Changing Permissions – Nautilus

8. Advanced Topics in Users, Groups and Permissions   03 Hrs.
User and Group ID Numbers, /etc/passwd, /etc/shadow and /etc/group files, User Management tools, System Users and and Groups, Monitoring Logins, Default Permissions, Special Permissions for Executables, Special Permissions for Directories.

9. The Linux Filesystem In-depth   06 Hrs.
Partitions and Filesystems, Inodes, Directories, Inodes and Directories, cp and inodes, mv and inodes, rm and inodes, Hard Links, Symbolic (or soft) Links, The Seven Fundamental Filetypes, Checking Free Space, Removable Media, Mounting CDs and DVDs, Mounting USB Media, Mounting Floppy Disks, Archiving Files and Compressing Archives, Creating, Listing and Extracting File Archives, Creating File Archives: Other Tools.

10. vim: An advanced Tex Editor   03Hrs.
Introducing vim, vim: A Modal Editor, vim basics, Opening a file in vim, Modifying a file, Saving a file and exiting vim, Using Command Mode, Moving around, Search and Replace, Manipulating Text, Undoing changes, Visual Mode, Using multiple "windows", Configuring vi and vim, Learning more.

11. Standard I/O and Pipes   02 Hrs.
Standard Input and Output, Redirecting Output to a File, Redirecting STDOUT to a Program(Piping), Combining Output and Errors, Redirecting to Multiple Targets (tee), Redirecting STDIN from a file, Sending Multiple Lines to STDIN.

12. Using the Bash Shell   03 Hrs.

Bash Introduction, Bash Heritage and Features, Command Line Shortcuts, History Tricks, Command Line Expansion, Command Editing Tricks, gnome-terminal

13. Configuring the Bash Shell   04 Hrs.

Bash Variables, Environment variables, The TERM Environment variable, The PATH Environment variable, Some common variables, Aliases, How bash expands a Command Line, Preventing Expansion, Login vs non-login shells, Bash startup tasks: profile, Bash startup tasks: bashrc, Bash exit tasks

14. Text Processing Tools   03 Hrs.

Tools for Extracting Text, Viewing File Contents, Viewing File Excerpts, Extracting Text by Keyword, Extracting Text by column, Tools for analyzing text, Gathering text statistics, Sorting Text, Eliminating Duplicate Lines, Comparing Files, Duplicating File Changes, Spell Checking with aspell, Tools for manipulating Text, sed, Special Characters for Complex Searches.

15. Shell Programming   06 Hrs.

Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences, continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

16. Investigating and Managing Processes   04 Hrs.

What is a Process? ,Listing Processes, Finding Processes, Signals, Sending Signals to Processes, Scheduling Priority, Altering Scheduling Priority, Interactive Process management tools, Job Control, Scheduling a Process to execute later, Crontab File format.

17. Finding and Processing Files   02 Hrs.

locate, locate Examples, find, Basic find Examples, find and logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.

18. Basic System Configuration Tools   04 Hrs.

TCP/IP Network Configuration, Managing Ethernet Connections, Graphical Network Configuration, Network Configuration Files, Printing in Linux, Setting the System's Date and Time, Managing Services.

RECOMMENDED BOOKS

MAIN READING
1. Maurice J. Bach, "Design of the Unix Operating System", Third Edition,2000,PHI.
2. Sumitabha Das, "Unix : Concepts and Applications", Third Edition, 2006,Tata McGraw Hill
3. ISRD Group, Basics of OS, UNIX and SHELL Programming" TMH (2006)

SUPPLEMENTARY READING
1. A User guide to unix system",Thomas Rebecca yate,Second Edition,2002,.Tata McGraw Hill.
2. Stephen Prata "Advanced Unix -A programmer's Guide".